

UNIT 2:

RECOGNITION, IDENTIFICATION AND DETECTION

LEARNING OBJECTIVES

By the end of this section, participants will be able to:

- List four basic clues for identifying hazardous materials
- Describe the DOT system of placarding
- Describe the NFPA 704 Marking System
- Identify highway cargo tanks that may carry hazardous materials by shape, and list at least one commodity carried in each
- Identify rail tank cars that may carry hazardous materials by shape, and list at least one commodity carried in each
- List other resources that can be used to further identify hazardous materials

INSTRUCTOR NOTES

Purpose of Unit:

This unit examines the four basic clues that will help First Responders recognize the presence of a hazardous material when they arrive at an incident scene.

Materials and Supplies:

Chalkboard or flip chart
Overhead transparency projector and transparencies 2-1 and 2-2
Slide projector and slides 12 through 57
Examples of DOT placards and labels
Examples of NFPA placards and labels

Instructor Preparation:

Obtain a set of DOT placards and labels, and an NFPA 704 marker in advance of class. If you cannot locate samples, use slides 12 through 35.

Copy sample bills of lading, rail consists, and way bills to discuss with your students. These items can be obtained through local shippers and railroads.

RECOGNITION AND IDENTIFICATION

Introduction

Tell the students:

- **What they will learn in this section**
- **Approximately how long it will take**

Your ability to recognize and identify the presence of hazardous materials is essential for your safety. Only after you identify – or at least classify – the material, can you decide on the appropriate action. Dispatch information may give you an initial warning, but this information is often incomplete or inaccurate. This unit describes how to detect the presence of hazardous materials by looking for four basic clues:

- Occupancy and location of a fixed facility
- Placards, labels, and markings
- Container shape and design
- Shipping papers or facility documents

You can also use your vision, aided by binoculars, and your hearing to detect the presence of hazardous materials.

Activity



Verbally conduct the Recognition and Identification quiz in the Instructor Materials section (Transparencies). Discuss the correct answers and write them on the transparency.

Questions

???

Ask the students the following questions:

- Name some occupancies in your area that have hazardous materials on site
- What chemicals do these occupancies use?
- Would you know how to protect yourself from exposure if you responded to a fire at the location?
- Do any of these companies use radioactive materials?

OCCUPANCY AND LOCATION

The occupancy and location of an emergency site can provide valuable clues. If the processes, materials used, and products manufactured at a particular site are known, First Responders can begin to make some determinations about the hazards that are likely to be involved.



Radioactive waste stored in drums at DOE facility

Remember, you may find hazardous materials incidents in sites other than industrial settings. A shopping center, dry cleaning facility, hardware store, or automobile repair shop could be the site of a chemical spill or fire involving hazardous materials.

Activity



Have the students name some types of businesses that use hazardous materials. Write these on the chalkboard. Under each business, have them list the specific chemicals that might be used.



Virtually any industry or business can store or use hazardous materials

Often, the people who use these materials are not aware of the potential hazards unless they work with the fire department to prepare for an emergency situation.

Use pre-incident planning as a way to educate yourself and the community about the safe use and storage of hazardous materials.

PLACARDS, LABELS, AND MARKINGS

Placards, labels, and markings provide information about the types and hazards of products being transported or stored. There are a number of marking systems required or strongly recommended where hazardous materials are present. The most common ones are discussed in this section.

The DOT System

The Department of Transportation (DOT) regulates the type of labels and placards that must be attached to hazardous materials containers and the vehicles that carry them.

DOT Hazard Classes

DOT placards are based on nine hazard classes:

- **Class 1** = explosives
- **Class 2** = gases (compressed, liquefied, or dissolved under pressure)
- **Class 3** = flammable/combustible liquids
- **Class 4** = flammable solid/dangerous when wet/spontaneous combustible
- **Class 5** = oxidizers/organic peroxides
- **Class 6** = toxic (poisonous)/infections
- **Class 7** = radioactive materials
- **Class 8** = corrosive materials
- **Class 9** = miscellaneous dangerous goods

DOT Placards and Labels

DOT **placards** are diamond-shaped signs (10-3/4 inches on each side) that are required to be affixed on each side and each end of vehicles carrying hazardous materials. Placarding requirements are very specific. Placards indicate the **primary hazard**—the most dangerous property—associated with the material being transported. Some materials also require subsidiary (secondary) placards, which do not carry class numbers.

DOT **labels** are 4-inch diamonds (or smaller, for cylinders) affixed to non-bulk packages of hazardous materials. Generally, they are required for the same materials for which placards are required. Unlike placarding, labeling is not limited to the material's primary hazard. So a package containing a material that meets the definitions of more than one hazard class must be labeled for each of those classes.

UN Identification Numbers

The corresponding UN (United Nations) 4-digit identification number must appear in the center of the placard or beside the placard. The 4-digit identification number may replace the class name in the center of the placard for bulk shipments of hazardous materials. However, it cannot replace the DANGEROUS placard or the class name for Radioactive materials or any class of Explosives.

UN numbers can be incorporated into a placard, or posted on a separate orange marker next to the placard.

Activity



Tell the students to refer to their resources and list at least three specific chemicals for each hazard class.

DOT Table 1 Materials

Certain categories of materials must always be placarded with their primary hazard placards, regardless of the amount being transported. These are referred to as **Table 1** materials because they appear in Table 1 of the placarding section of the Code of Federal Regulations (49 CFR 172.500).

DOT Table 2 Materials

Table 2 includes all other placardable hazardous materials. However, these materials do not become “placardable” unless 1,001 pounds or more are being carried (of any one, or a combination of Table 2 materials). In other words, any quantity of Table 1 material must be placarded. Table 2 materials must be placarded only if the gross weight is 1,001 pounds or more.

Mixed Loads

When the total weight of two or more materials from Table 2 is 1,001 pounds or more, a Dangerous placard may be used. If 5,000 pounds (2,205 pounds as of October, 1997) or more of any of these materials are loaded at one location, the corresponding placard must be used, along with a Dangerous placard or the class placard for the other materials.

The materials in Tables 1 and 2 are listed on the following page.

Activity



Show the examples of the DOT placards and labels you have obtained.

Slides



Show slides 12 through 35 as you discuss the DOT placarding system.

Transparency



Show Transparency 2-1 and discuss Table 1 materials.

Transparency



Show Transparency 2-2 and discuss Table 2 materials.

TABLE 2.1 HAZARDS CHECKLIST
NON-STRUCTURAL AND TRANSPORTATION ALARMS
DOT TABLE 1 MATERIALS

IF A VEHICLE CONTAINS A MATERIAL CLASSED AS:	THE VEHICLE MUST BE PLACARDED AS:
Explosives (Division 1.1)	Explosive
Explosives (Division 1.2)	Explosive
Explosives (Division 1.3)	Explosive
Poison gas (Division 2.3)	Poison gas (Toxic Gas)
Dangerous when wet (Division 4.3)	Dangerous when wet
Toxic Materials and Infectious Substances (Class 6)	Poison (Toxic)
Radioactive (Class 7, those substances in Radioactive III packaging only)	Radioactive

**DOT TABLE 2 MATERIALS
(1,001 LBS. OR MORE)**

IF A VEHICLE CONTAINS A MATERIAL CLASSED AS:	THE VEHICLE MUST BE PLACARDED AS:
Explosives (Division 1.4)	Explosive
Explosives (Division 1.5)	Blasting agent
Explosives (Division 1.6)	Explosive
Non-flammable gas (Division 2.2)	Non-flammable gas
Oxygen (Division 2.2)	Oxygen
Flammable gas (Division 2.1)	Flammable gas
Combustible liquid (Class 3)	Combustible
Flammable liquid (Class 3)	Flammable
Flammable solid (Division 4.1)	Flammable solid
Oxidizer (Division 5.1)	Oxidizer
Organic peroxide (Division 5.2)	Organic peroxide
Toxic Materials and Infectious Substances (Class 6)	Toxic
Corrosive (Class 8)	Corrosive
Irritating	Dangerous

Activity

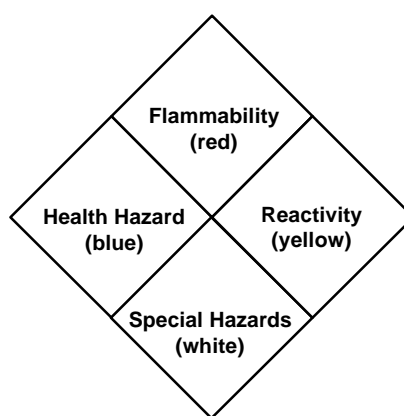


Show the students examples of NFPA placards for specific but common chemicals. Have the students identify the hazards and, if possible, the specific chemical. Give them hints as needed.

NFPA Marking System

The National Fire Protection Association (NFPA) has developed a marking system for fixed sites to indicate the dangers associated with various hazardous materials handled at a location. This marking system is not used in transportation, and is not federally regulated or required. Local jurisdictions, however, may require the use of the system at fixed sites.

The NFPA marking system (detailed in NFPA 704) uses a diamond divided into color-coded quadrants. Each quadrant is a specific color and indicates a material's health hazard (left), flammability hazard (top), reactivity hazard (right), or special hazards (bottom).



The health, flammability, and reactivity hazards are ranked from **0** to **4**, with 0 indicating no risk and 4 indicating the greatest risk. The specific hazard area may contain a special symbol or letter indicating a specific danger. For example, **OX** indicates an oxidizer, a trefoil (or propeller) indicates a radioactive material, and a **W** indicates a water reactive material. The NFPA marker for sulfuric acid is shown on the next page. The numbers indicate a fairly significant health hazard (3), no flammability hazard (0), and moderate reactivity (2). The **W** indicates that sulfuric acid is water-reactive.

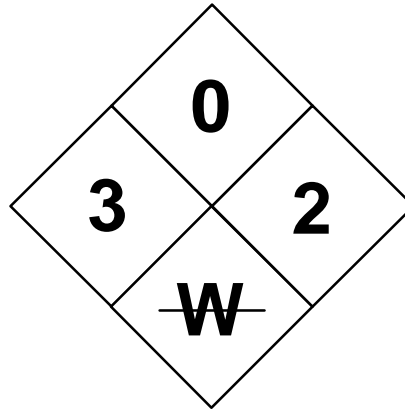


Table 2.2 on the following page describes the rating system for the degree of hazard.

Hazardous Materials Information System

The Hazardous Materials Information System is very similar to the NFPA marking system. HMIS uses the same color coding and number indicators, but the marker is in bar form rather than diamond-shaped.

TABLE 2.2
NFPA 704 MARKING SYSTEM

#	HEALTH HAZARD	FLAMMABILITY	REACTIVITY
4	Very short exposure could cause death or major residual injury	Will rapidly and completely vaporize at atmospheric pressure and normal temperature, or will readily disperse in air and burn	Capable of detonation or explosive reaction at normal temperatures and pressures; sensitive to mechanical or localized thermal shock
3	Short exposure could cause serious temporary or residual injury	Can ignite under almost all normal temperature conditions	Capable of detonation or explosive reaction if exposed to a strong ignition source or if heated under confinement; may react explosively with water
2	Intense or continued (but not chronic) exposure could cause temporary incapacitation or possible residual injury	Capable of ignition when exposed to relatively high temperatures	Readily undergoes violent chemical change at elevated temperatures and pressures; may react violently with water
1	Exposure could cause irritation, but only minor residual injury	Must be heated before ignition will occur	May become unstable when exposed to heat and pressure; may react with water, but not violently
0	Exposure under fire conditions would present no hazard beyond that of ordinary combustible material	Will not burn	Normally stable, even under fire conditions; not water reactive

Key Points



The military has its own marking system with four numbered classes:

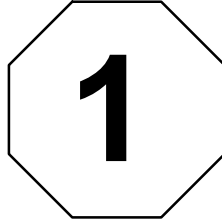
- **Class 1: Mass Detonation Hazard**
- **Class 2: Explosion with Fragmentation Hazard**
- **Class 3: Mass Fire Hazard**
- **Class 4: Moderate Fire Hazard**

Military Marking System

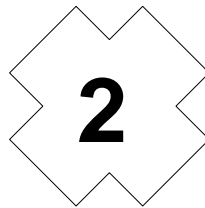
The military has developed its own marking system which is used on military shipments at fixed site facilities. This system consists of four numbered classes as well as three special hazards.

The four military classes are:

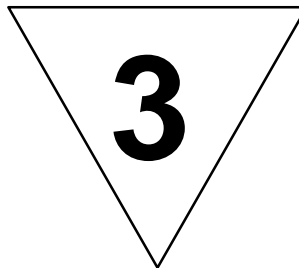
Class 1: Mass Detonation Hazard



Class 2: Explosion with Fragmentation Hazard



Class 3: Mass Fire Hazard



Class 4: Moderate Fire Hazard



The three special hazard symbols are:



Chemical Hazard



Apply No Water



Wear Protective Breathing Apparatus

Key Points



Container size and shape help you identify:

- **The presence of hazardous material**
- **The type of material**
- **Specific materials**

CONTAINER SHAPES AND DESIGNS

Specific materials

The shape, size and design of containers used in transportation and storage may give you other clues that hazardous materials are present. Shape and design may also indicate the general type of material in the container – a compressed gas, for example, is easily identifiable by a cylindrical container with rounded ends. Container shapes are often specific for certain materials, and many are regulated by federal law.



Wooden crates carrying LSA radioactive material

Key Points



Bulk containers hold:

- **119 gal. (liquid)**
- **882 lbs. (solids)**
- **1,001 lbs. (gases)**

Bulk and Non-Bulk Containers

Both bulk and non-bulk containers are used to transport hazardous materials. **Bulk containers** hold hazardous materials without an intermediate form of containment. These types of containers include highway cargo tanks, tank cars that transport materials by rail, and other containers (except watercraft) with:

- A maximum capacity of more than 119 gallons (450 liters) for containers of liquids
- A maximum net capacity of more than 882 pounds (401 kilograms) for containers of solids
- A water capacity greater than 1,001 pounds (454 kilograms) for containers of gases

Non-bulk packaging such as 5-gallon drums, bottles, and dewars include all containers with capacities less than these.

Highway Carriers

Most cargo tanks in service today were built to MC (motor carrier) specifications, and they are often identified by the specifications to which they were built, such as MC 306, MC 307, etc. Those cargo tanks which were built after August 31, 1993, must conform to new DOT specifications (DOT 406, DOT 407, and DOT 412). However, many tanks built to the older MC specifications will remain in service for several years.

Each type of cargo tank is shown on the following pages, along with a general description of the tank and its common cargo.

Key Points



Cargo tanks are built to either:

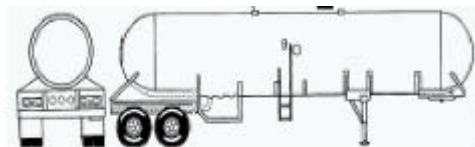
- **MC (motor carrier) specs,**
or
- **DOT specs**

Pressure Cargo Tank (MC 331)

Slides



Show slide 36 and discuss pressure cargo tanks.



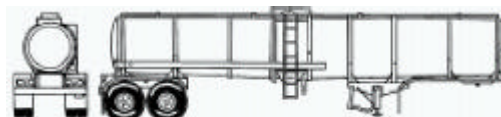
- Rounded ends
- Transports gases liquefied through compression (propane, butane, anhydrous ammonia, and chlorine)

Low Pressure Cargo Tank (MC 307 or DOT 407)

Slides



Show slides 37-38 and discuss low pressure cargo tanks.



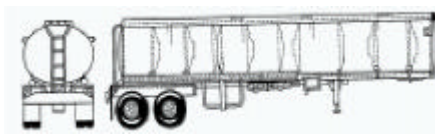
- Circular or horse-shoe shaped cross sections and flat ends
- May have rollover protection
- Transports flammable or combustible liquids, mild corrosives, poisons, and almost all other types of liquid chemicals

Non-Pressure Cargo Tank (MC 306 or DOT 406)

Slides



Show slide 39 and discuss non-pressure cargo tanks.



- Elliptical cross sections and flat ends
- Usually compartmented
- Transports petroleum products such as gasoline and fuel oil

Corrosive Liquid Cargo Tank (MC 312 or DOT 412)

Slides



Show slide 40 and discuss corrosive liquid cargo tanks.



- Circular cross-sections and flat ends
- Relatively small diameter with visible stiffening rings
- Transports corrosives such as sodium hydroxide, hydrochloric acid, and sulfuric acid as well as other high-density liquids

Cryogenic Liquid Cargo Tank (MC 338)

Slides



Show slide 41 and discuss cryogenic liquid cargo tanks.



- Circular cross sections and rounded ends
- Heavily insulated with piping and valves in a rear cabinet
- Transports gases liquefied through temperature reduction, such as liquid oxygen (LOX), liquid nitrogen, liquid hydrogen, and liquid helium

Other types of highway carriers that might transport hazardous cargo include :

Slides



Show slides 42-45 and discuss other types of highway carriers.

- Covered hopper trucks
- Tube trailers
- Tractor trailers
- Box trailer
- Vans, step-vans, and flatbed pickup trucks

Railroad Tank Cars

Tank cars are bulk containers used to carry both hazardous and non-hazardous materials by rail. The specific type of materials carried in a tank car determines how the tank is constructed, as well as its size, fittings, linings, and other features.

Key Points



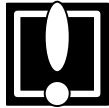
The specific cargo in a tank car depends on the car's

- Construction
- Size
- Fittings
- Linings and other features

When a rail incident occurs, railroad personnel are often the best source of information. They are the experts on rail car design and use, and can provide you with information that could save your life. Becoming familiar with the railroad companies operating in the community before an incident occurs is essential.

Although there are exceptions, most tank cars carry only a single commodity. In general, they all look very similar, with circular cross sections and rounded heads. Because of their similar design, you must learn to identify specific tank car characteristics for clues about the nature of the commodity being transported.

Key Points

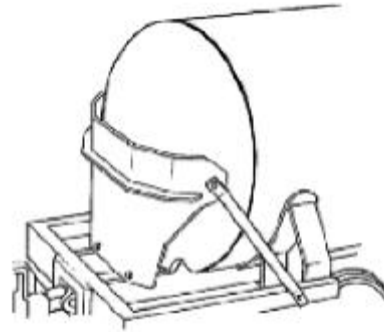


Head shields:

- Protect heads on pressure tank cars from coupling punctures
- Used on non-pressure tank cars carrying ethylene oxide

One feature that is added to pressure tank cars and to certain non-pressure tank cars transporting hazardous materials is a **head shield**. Head shields are required for non-pressure tank cars transporting ethylene oxide. Head shields protect the heads of tank cars from puncture by the coupling mechanism. Half-head

or trapezoid-shaped plates of steel are added to the lower half of each head. Some tank cars incorporate either full or bottom half-head shields into a protective jacket that covers the entire tank car. This makes the head shield difficult to see.



Head Shield

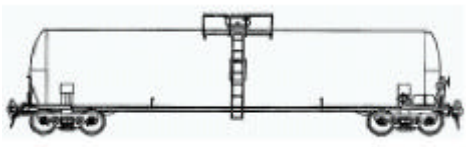
Tank cars can be divided into several different categories, each with its own distinct characteristics. The most common are discussed in this section.

Slides



Show slides 46-48 and discuss pressure tank cars.

Pressure Tank Car



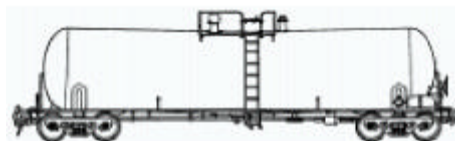
- Designed for pressures from 100 psig to 600 psig
- Fittings inside a protective housing on top of tank
- Housing distinguishes pressure from non-pressure tanks
- Transports flammable and non-flammable compressed gases or poisonous compressed gases

Slides



Show slides 49-50 and discuss non-pressure tank cars.

Non-Pressure Tank Car



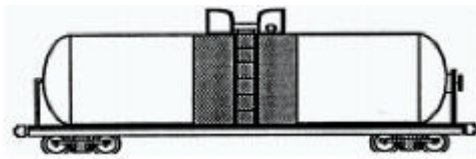
- Designed for pressures below 100 psig at 105°F-115°F
- Distinguished from pressure tank cars by manway and visible fittings
- May be compartmented with fittings and manways for each compartment
- Transports flammable liquids, flammable solids, oxidizers and organic peroxides, poisons, corrosives, and non-hazardous materials

Slides



Show slide 51 and discuss corrosive liquid tank cars.

Corrosive Liquid Tank Car



- Similar to non-pressure tank cars
- Can be distinguished by staining around manway
- Some painted with vertical stripe of corrosion-resistant paint

Slides



Show slides 52-53 and discuss cryogenic liquid tanks cars.

Cryogenic Liquid Tank Car



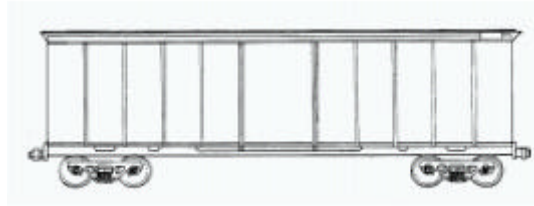
- Carry low pressure refrigerated liquids (minus 130°F and below)
- Designed as a tank-within-a-tank for insulation
- Product may vent under normal conditions

Box Car

Slides



Show slide 54 and discuss box cars.



- Enclosed cars with steel or wooden interiors
- Used for general freight
- Carries drums, boxes, cylinders or other non-bulk containers

Gondola Car

Slides



Show slide 55 and discuss gondola cars.



- Uncovered, with low sides and ends
- Transport bulk ores and other solid materials
- Often used to carry radioactive materials

Other Types of Containers

Ton Containers

When shipped by rail, ton containers are carried on special flat cars, in boxcars or gondola cars, and in trailer-on-flat-cars or container-on-flat-cars.



Ton Container

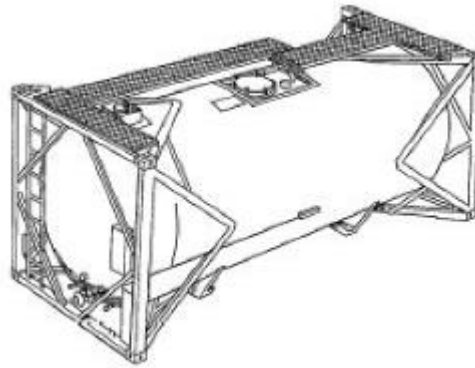
All fittings are located in the heads, including fusible plugs and/or spring-loaded safety relief valves. Safety relief devices are prohibited for certain poisonous or noxious materials.

Ton containers transport gases like anhydrous ammonia, butadiene, chlorine, phosgene, refrigerant or dispersant gases, or sulfur dioxide.

Tank Containers

Tank containers consist of a single metal tank mounted inside a sturdy metal supporting frame. This unique frame structure, built to rigid international standards, makes tank containers intermodal. This means that they can be used in two or more modes of transport, such as rail, highway, or water.

The tank is generally built as a cylinder enclosed at the ends by heads. Its capacity is generally less than 6,340 gallons (about 24,000 liters). Other tank shapes and configurations are rare, as are tanks with multiple compartments.



Tank Container

Slides



**Show slides 56-57 and
discuss intermodal containers.**

Intermodal Containers

Intermodal containers are used to transport liquid and solid materials. Fifty-five gallon drums or other large non-bulk containers are often grouped together in intermodal containers. The advantage to these types of containers is that they can be shipped via ground, air, or water without the contents being unloaded.

SHIPPING PAPERS AND FACILITY DOCUMENTS

Activity



If you have obtained sample shipping papers, distribute them to the students and reference them as you cover the information in this section.

All shipments of hazardous materials, as defined by DOT, must be accompanied by shipping papers. The type of shipping paper varies depending on the mode of transportation. Table 2.3 lists the type of shipping paper that corresponds to each mode of transportation. Subsequent pages show samples of the different types of shipping papers.

Shipping papers provide detailed information about the contents of the shipment. They may alert you to the presence of hazardous materials through a variety of required entries. As valuable as shipping papers are, keep in mind that they are not always complete, and sometimes even required entries are missing.

Shipping papers may include the following information:

- Proper shipping name, hazard class and division, DOT Identification Number, total quantity by weight or volume
- EPA waste stream number, EPA waste characteristic or “D” number—this may indicate that waste is hazardous, even if it cannot be identified as a particular chemical (only required for Class 9 materials – see 40 CFR 262.20)
- Placard notation, placard endorsement (by rail and highway)
- RQ (reportable quantity) notation indicating that a hazardous material is being shipped in an amount exceeding a federally specified level
- POISON or POISON—INHALATION HAZARD or INHALATION HAZARD notation
- Other notations such as CORROSIVE, EXPLOSIVE, etc.
- Descriptions of the type of hazard such as marine pollutant or subsidiary hazard

TABLE 2.3

SHIPPING PAPERS AND MODES OF TRANSPORTATION

MODE OF TRANSPORTATION	TITLE OF SHIPPING PAPER	LOCATION OF SHIPPING PAPERS	RESPONSIBLE PERSON
Highway	Bill of Lading or Freight Bill	Cab of vehicle within reach of the driver	Driver
Rail	Waybill and/or Consist	Member of train crew (conductor or engineer) Shipper	Conductor
Water	Dangerous Cargo Manifest	Warehouse or pipe-like container on barge	Captain or master
Air	Air Bill with Shipper's Certification for Restricted Articles	Cockpit (may also be found attached to the outside of packages)	Pilot

Activity



Have the students use their *Emergency Response Guidebooks* to research the hazards of one of the materials listed in the shipping papers on the following pages.

In emergencies you may not have ready access to shipping papers. However, federal regulations require the driver of a cargo tank to carry shipping papers in the cab of the vehicle or on his/her person. But in an emergency, you may not be able to approach the vehicle, or the driver may be unconscious or otherwise unavailable. In these cases, you may be able to obtain shipping paper information from at least two other sources: the shipper/generator, and/or the carrier. If the cargo is hazardous waste, the disposal facility will also have copies. In case of an accident, you may be able to see the name of the carrier on the exterior of the cab or the vehicle itself.

STRAIGHT BILL OF LADING - SHORTFORM
ORIGINAL NOT-NEGOTIABLE

DATE 05/02/96

NAME OF CARRIER **WILCO DELIVERY**

RECEIVED, subject to the classifications and lawfully filed tariffs or contracts in effect on the date of issue of this Bill of Lading, provided however, when the carrier and shipper have agreed to an individually-determined rate, classification, rule or practice, shipment shall be governed by the rate and rules to which the parties agreed.

NCH Shipper's No. 123874

To:

3302 RICHARDSON ST
BLDG 6
HOUSTON TX 77001

From:

NATIONAL CHEMSEARCH
2730 CARL ROAD
IRVING, TEXAS 75062

Freight Charges PREPAID

Send Bill To:
P.O. Box 152120
Irving TX 75062-2120

P. O. 110466

Shipper's No. 123874

CUSTOMER NO. 0274P

Carrier Instructions:

Line No.	No. Items	HT	Description of Articles Special Marks & Exceptions	Weight LBS	Class	Quantity / Package	Product Desc.	EPA
076	1	X	CAUSTIC ALKALI LIQUIDS, N.O.S., (SDONUM HYDROXIDE), 8, UN1719 PGIII NMFC48550	384	065	1 X35	076 SHINY SIDE	
078	1		SUB 3	2	085	1 EACH	109150400	
239	2		PUMPS, HAND., NMFC127700	16	100	2 EACH	078 DRUM PUMP M150-XL-PLASTIC	
			SPRAYERS, HAND HELD 8 BUT LESS THAN 10 LBS., NMFC177670 SUB 6				180362500	
	3	1	TOTAL	382			239 MAXI-BLASTER	
			*** EMERGENCY PHONE (214) 438-1381 ***				188122500	

Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and terms and conditions are hereby agreed to and in proper condition for transportation according to the Department of Transportation.

Driver hereby acknowledges that a current copy of the DOT emergency response guidebook is in the vehicle and that the driver has read and understood the instructions contained therein and that the driver has been advised of the appropriate hazardous material placards.

SHIPPER: NATIONAL CHEMSEARCH



CARRIER

TRAILER NO.

PER *John Davis*

DATE MAY 02 1996

PAGE 1

STRAIGHT BILL OF LADING - SHORT FORM - ORIGINAL - Not Negotiable									
Shipper: FLUOR DANIEL FERNALD, INC. C/O USDOE 7400 WILLEY ROAD FERNALD OH 45030-					Shipper No: 2143 Date: 04/09/97 Purchase/ Customer Order No.				
<small>NOTED: Subject to the restrictions and terms in effect on the date of the date of this Bill of Lading, the property described below in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined as shown below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier at all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.</small> <small>Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.</small>									
Consignee: BECTRIL NEVADA CORPORATION FOR USDOE WASTE MANAGEMENT DEPARTMENT MANAGER NEVADA TEST SITE - ZONE 2 MERCURY NV 89023-					CARRIER: LGRT LANDSTAR RANGER  				
Carrier No.: 716733 Section 13712: 305SUP21 Tender No.:					SEAL #: 00355				
Route: Ranger Transportation, Inc.									
NO	PKGS	HTM	Description of Articles (Subject to Condition), Kind of Package, Special Marks and Exceptions (See NMFC Item (Rate) 360)	Weight (Subject to Correction)	Class	Rate	Charges	Subject to Section 7 of conditions, if the shipment is to be delivered to the consignee without release on this document, the consignee shall sign the following statement: The carrier shall not make delivery of the shipment without payment of freight and all other lawful charges.	
8	BOXES	RQ	Radioactive Material, Low Specific Activity, R.O.S., 7, UN2912, LSA-II, Radionuclides - Thorium Natural Th-228, Th-230, Ra-228 Material Form - Solid Chemical Form - Oxide Total Activity - 41,75226557 GBq (1,12843951 Curies) (Gross Weight - 15,408 Kg)	33970					FDF "Signature of consignee" If freight charges are to be prepaid, write or stamp here "TO BE PREPAID" PREPAID Note: When the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated (by the shipper to be not exceeding) \$ _____ per lb. Job order, reference, account, or work order number _____ Charge BACAP _____ Savings: \$ _____ Label(s) applied _____ (Printer(s) Required) Radioactive
1	BOX	RQ	Radioactive Material, Low Specific Activity, n.o.s., 7, UN2912, LSA-II Radionuclides - U-Depleted Th-230, Th-228, Pb-210 Material Form - Solid Chemical Form - Oxide Total Activity - 6,06706945 GBq (0,16397485 Curies) (Gross Weight - 2,339 Kg)	5156					
TOTALS:				39126	LBS	9	Boxes		
IN THE EVENT OF AN EMERGENCY, PHONE COLLECT (513) 545-4444 - 24 HOURS.									
ITEM NO	NMFC 100	ITEM NO	COMMODITY NO FOR SHIPPER REPORTING	PACKAGING TYPE	NPM NO				
1									
2									
Remarks: *****EMERGENCY RESPONSE GUIDE #162**** EXCLUSIVE USE SHIPMENT ETA: 7:00 a.m. Monday, April 14, 1997 For curies per container, see Page 4 of 4 741 No. GVC-VAB-160 SS-SO No. 5764 TECHNICAL CONTACT: Donna J. Allen <small>This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. (Applicable for Hazardous Materials Only.)</small> Shipper: USDOE, C/O FLUOR DANIEL FERNALD Acting under contract to: DE-AC24-93OR21978 with U.S. Dept. of Energy Per: <i>Donna J. Allen</i> Date: 04/10/97 P.O. Box 538704 Cincinnati OH 45253 TRANSPORTATION DEPT. - Permanent Post Office Address of Shipper									
<small>*This shipment is for U.S. Department of Energy and the actual total transportation charges paid to the carrier(s) by the consignee or consignees are assignable to, and shall be reimbursed by, the U.S. Government and is subject to the terms and conditions set forth in the standard form of the U.S. Government Bill of Lading and to any available special rates or charges. (41 CFR 101-40.60 and 41 CFR 40.30)</small> *The attention on the face hereof and to the terms and conditions are hereby noted: Carrier: <u>Ranger Transportation, Inc.</u> Per: <i>Robert L. Larkin</i> Date: 4/10/97									

1. IS & ON 05/13/96		DATE: 05/13/96	
TIME: 10:36:30AM		PRINTED BY: 6061JF	
*** GATOR FREIGHTWAYS INC. ***		CHECKER #: 1301	
DRIVER: HUSTON-MELTON, LEROY		FROM: HOUSTON, TX	
LOAD ON UNIT: SNA174280		TO: SAN ANTONIO, TX	
FROM: HOUSTON, TX		TO: SAN ANTONIO, TX	
CAPACITY: FUL		DOLLY: 1	
<p>*** SUPERVISOR --- If Repairs Required **</p> <p>SHOP NOTIFIED -DATE/TIME</p> <p>CONTACT NAME</p>			
<p>CONSIGNEE NAME/ ADDRESS</p> <p>CITY</p> <p>DES REVENUE</p> <p>LOAD TO</p>			
<p>WACKENHUT CORRECTINS SAN ANTONIO TX SNA 269.41 838-U</p> <p>TX 218 S LAREDO 78205</p>			
<p>SHIPPER</p> <p>U E INDUSTRIES</p> <p>DALLAS</p>			
<p>PHOSPHORIC ACID, 8. CORROSIVE, UN1805, PG111</p> <p>SODIUM HYDROXIDE SOLUTION, 8. CORROSIVE, UN1824, PG11</p> <p>HYPOCHLORITE SOLUTIONS WITH MORE THAN 5 PERCENT BUT LESS THAN 16 PERCENT AVAILABLE CHLORINE, 8. CORROSIVE, UN1791, PG111</p> <p>HYPOCHLORITE SOLUTIONS WITH MORE THAN 5 PERCENT BUT LESS THAN 16 PERCENT AVAILABLE CHLORINE, 8. CORROSIVE, UN1791, PG111</p> <p>SODIUM HYDROXIDE SOLUTION, 8. CORROSIVE, UN1824, PG11</p> <p>CHEMICAL EMERGENCY #800-424-9200</p>			
<p>4WAY SKIDS FOR PRO 1810025101 ARE 0</p>			
<p>WACKENHUT CORRECTINS SAN ANTONIO TX SNA 269.41 838-U</p> <p>TX 218 S LAREDO 78205</p>			
<p>SHIPPER</p> <p>U E INDUSTRIES</p> <p>DALLAS</p>			
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<p>SHIPPER</p> <p>U E INDUSTRIES</p> <p>DALLAS</p>			

PAGE 1 of 1

VESSEL	COLUMBIA	OFF. NO.	120000
VOYAGE	0108	DATE	7/2/70
MASTER	CAPT. COFF	PORT DEPARTURE	SAINT PIERRE, M.
FLAG	U.S.	FINAL PLAN	SAT. JUNI, P.P.

NO.	COMMODITY (TRUE SHIPPING NAME)	CLASSIFICATION	LABEL	CONTAINER NO.	STOWAGE	QTY.	TYPE	WT.
1	SODIUM PERSULPHATE (WATER TREATMENT COMPOUND)							
2		OXIDIZER	UN1505	SDHU 104214	090304	10	PAIL	520
3	CALCIUM HYDROXIDE (EXTURE DRY)							
4		OXIDIZER	UN1749	SDHU 132616	090404	20	PAIS	214
5	HYDROCHLORIC ACID	CORROSIVE MATERIAL	UN1789	SDHU 132818		3	CRIS	72
6	ACETIC ACID GLACIAL	CORROSIVE MATERIAL	UN1789	SDHU 132818	090404	6	CTHS	304
7	FLAMMABLE LIQUID 100	FLAMMABLE LIQUID	UN1993	PRMU 220218		1	SKID	1705
8	HYDRO (HYDRO)	FLAMMABLE LIQUID	UN1307	PRMU 220218		1	DRM	394
9	ETHYL ALCOHOL	FLAMMABLE LIQUID	UN1170	PRMU 220218	090407	48	PAIL	1920
10	METHYL ETHYL KETONE	FLAMMABLE LIQUID	UN1193	PRMU 202218		1	PAIL	306
11	ETHYL ALCOHOL	FLAMMABLE LIQUID	UN1170	PRMU 220218		15	PAIL	600
12	BATTERIES WET FILLED WITH ACID							
13		CORROSIVE MATERIAL	UN2794	PRMU 220413	070505	713	PKG.	2-852
14	CORROSIVE SOLID 100	CORROSIVE MATERIAL	UN1758	TILU 450088		1	DRM	503
15	CORROSIVE LIQUID (HOSICLAWING LIQUID)							
16		CORROSIVE MATERIAL	UN1780	TILU 450088	090407	4	DRMS	2160
17	ETHANOL	FLAMMABLE LIQUID	UN1170	LYMU 450145	090408	5	DRMS	2868
18	CEMENT LIQUID	FLAMMABLE LIQUID	UN1133	LYMU 450145		8	BMS	300
19	INK	FLAMMABLE LIQUID	UN1210	LYMU 450145	090408	5	CTH	28
20	INK	FLAMMABLE LIQUID	UN1210	LYMU 450145		1	CTH	48
21	CAUSTIC ALKALI LIQUID (HOSICLAWING LIQUID)							
22		CORROSIVE LIQUID	UN1718	LYMU 450673		150	CTH	2170
23	CAUSTIC ALKALI LIQUID (INSULATING MATERIAL)							
24		CORROSIVE MATERIAL	UN1718	LYMU 450573	090807	15	CTH	375
25	INK	FLAMMABLE LIQUID	UN1263	SDHU 450724	090807	3	PAIS	144
26	ADHESIVE	FLAMMABLE LIQUID	UN1133	PRMU 436438	090807	7	DRMS	674
27								
28								
29								
30								

I, D. C. Giff, acknowledge the correction of this manifest to the best of my knowledge and belief.

MASTER OR LICENSED DECK OFFICER

I, CHESTER P. STILLING, ASST. CLERK, the undersigned certify that, the above information based on information furnished by the subject, is true and correct to the best of my knowledge and belief.

SUPERVISION OF PERSONAL PREPARATION: ☐

Activity



Refer the students to the MSDSs in the Appendix to Unit 3, and explain that while the information is standard, the format may vary by chemical and from manufacturer to manufacturer.

Material Safety Data Sheets

Documents for fixed facilities include **material safety data sheets** (MSDSs) and related reports. The owner or manager of the facility is required to keep MSDSs for all hazardous materials (above an established quantity) handled or stored at the facility. These should be made available to you during pre-planning. An MSDS can provide information on the physical and chemical properties of the material, the hazards associated with it, and basic directions for response actions.

Your pre-incident plan should include information on where the facilities in your community keep MSDSs. For example, MSDSs may be kept in an office some distance from the affected area of the building. MSDSs and other facility documents may be kept in a container that is set aside for use by emergency responders. MSDSs may look very different from one another, as you can see from the samples provided in the appendix.

You may not have preplanned the facility. Or, you may find that a previously preplanned site has been storing or using chemicals not included in your preplan. In either situation, you will have to look elsewhere for the appropriate MSDS.

Like all documents, the information that you find on an MSDS should be verified with other sources of information. The information on an MSDS may be incorrect, incomplete, or not applicable to your situation. A blank MSDS is shown on the following pages.

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NUMBER	DATE
ADDRESS		
CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS	
CHEMICAL FAMILY	FORMULA	

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY

HAZARDOUS COMPONENT(S) (Chemical and Common Name(s))	%	OSHA PEL	ACGIH TLV	CAS NUMBER

SECTION III - PHYSICAL AND CHEMICAL CHARACTERISTICS

BOILING POINT	VAPOR DENSITY (Air = 1)	SPECIFIC GRAVITY (H ₂ O = 1)	VAPOR PRESSURE (mm Hg)
SOLUBILITY IN WATER		REACTIVITY IN WATER	
APPEARANCE AND ODOR			MELTING POINT

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT (°F or °C)	METHOD USED	FLAMMABLE LIMITS	LEL (LOWER)	UEL (UPPER)
AUTO-IGNITION TEMPERATURE	EXTINGUISHING MEDIA			
SPECIAL FIRE FIGHTING PROCEDURES				
UNUSUAL FIRE AND EXPLOSION HAZARDS				

SECTION V - HEALTH HAZARD DATA			
THRESHOLD LIMIT VALUES	8 HOUR TWA	STEL	
EFFECTS OF OVEREXPOSURE	ACUTE		
	CHRONIC		
PRINCIPAL ROUTES OF ABSORPTION			
IS CHEMICAL A CARCINOGEN?		IS CHEMICAL A MUTAGEN?	
EMERGENCY AND FIRST AID PROCEDURES			
SECTION VI - PHYSICAL HAZARDS (REACTIVITY DATA)			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE		
INCOMPATIBILITY (Materials to Avoid)			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR		
SECTION VII - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES			
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE			
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED			
WASTE DISPOSAL METHODS (Consult Federal, State, and Local Regulations)			
SECTION VIII - SPECIAL PROTECTION INFORMATION			
RESPIRATORY PROTECTION (Specify Type)		PROTECTIVE GLOVES	
EYE PROTECTION		OTHER PROTECTIVE CLOTHING OR EQUIPMENT	
VENTILATION	LOCAL EXHAUST	SPECIAL	
	MECHANICAL (General)	OTHER	
WORK/HYGIENIC PRACTICES			

UNIT 2

APPENDIX

Information Sources

After you have looked for clues and found that a hazardous material is present, you can draw on a number of resources to identify the specific material and hazards involved. Identification of the hazard will help you decide the appropriate course of action.

The resources available to you will depend on your jurisdiction, equipment, training, and standard operating procedures. Those resources commonly used to provide additional information about hazardous materials include reference books, telephone hotlines, and detection devices.

Reference Books

There are several reference books available to assist in identifying hazardous materials. Two commonly-used references are the North American Emergency Response Guidebook and the NIOSH Pocket Guide to Hazardous Materials. Using both of these references, you can find basic information about the physical properties of chemicals and initial response actions.

The *North American Emergency Response Guidebook* can assist you in making decisions about response actions. However, it has advantages as well as disadvantages. For example, it includes clear instructions for use, but the information is very general.

In addition, it is only one source of information. You should always check the recommendations for actions with at least two other sources, including your jurisdiction's standard operating procedures.

The *NIOSH Pocket Guide to Chemical Hazards* lists materials by their chemical name and provides descriptions of the chemical and exposure limits, along with first aid procedures in the event of exposure.

You must become familiar with the Pocket Guide prior to using it so that you can use it quickly and understand the abbreviations used throughout the book.

Telephone Hotlines

Telephone hotlines can provide general information about hazards and, possibly, responder actions. When calling a hotline in an emergency, be prepared to give all the information you can regarding the situation.

Hotlines frequently used by emergency response personnel include the following:

The **National Response Center** maintains an emergency hotline for transportation incidents involving hazardous materials. Their number is found in the North American Emergency Response Guidebook: (800) 424-8802; or in the Washington, D.C. area (202) 267-2675.

CHEMTREC, The Chemical Transportation Emergency Center, provides 24-hour information for transportation incidents. This organization carries MSDSs for all chemicals manufactured in the United States.

CHEMTREC is funded by the chemical industry. It provides information on fixed sites and transportation hazardous materials emergencies, and will give you immediate advice on the nature of the product and the steps you should take to handle the early stages of a problem. They will not, however, give you specific tactical advice. Tactical measures are specific to your department depending on personnel skills, knowledge, and resources.

CHEMTREC also maintains a current list of state and federal radiation authorities who provide information and technical assistance on handling incidents involving radioactive materials.

Calls to CHEMTREC should be limited to emergencies only.

CHEM-TEL, INC. is another emergency response communication service.

CANUTEC provides a similar service in Canada. CANUTEC is the Canadian Transport Emergency Centre. It is located in Ottawa and is operated by the Transport Dangerous Goods Directorate of Transport Canada.

CANUTEC provides a national bilingual advisory service and is staffed by professional chemists experienced and trained in interpreting technical information and providing emergency response advice.

CHEMTREC, CHEM-TEL, INC., and CANUTEC will assist one another in providing information to emergency responders. Their telephone numbers are listed near the front of the North America Emergency Response Guidebook.

SETIQ and **CECOM** Serve similar functions in Mexico. SETIQ is the Emergency Transportation System for the chemical industry. CECOM is the National Center for Communications of the Civil Protection Agency. Telephone numbers for SETIQ and CECOM can be located in the North American Emergency Response Guidebook.

ATSDR, the Agency for Toxic Substances and Diseases, provides technical assistance via telephone and can be reached at (404) 639-0615.

Your local **poison control center** can provide information to assist in the treatment of exposed individuals. Check the front cover of your local telephone book for this number.

In addition, you can maintain a list of **regional, state, and local emergency resource numbers**. These may include regional response teams from the Environmental Protection Agency, response teams from the Department of Energy, or regional and local resources in your area.

Many **manufacturers and shippers** maintain telephone help lines. You should contact the chemical manufacturers in your area to learn if they have hotlines or resources that you can use in an emergency.

It may also be helpful to contact other local facilities to find out the names of chemical shippers with whom they have contracted.

You also may be able to obtain information on hazardous materials through **software** and computer **databases**. Many systems carry chemical information very similar to that found on the manufacturer's MSDS, as well as additional data.

Software

CAMEO II TM is a software package developed by the National Oceanic and Atmospheric Administration. This system is designed to help emergency planners and first responders plan for and respond to incidents involving chemical emergencies. It contains information on thousands of commonly transported chemicals and an air dispersion model to assist in evaluating release scenarios and evacuation options. In addition, it contains several databases and computation programs to assist in meeting the planning provisions of SARA Title III. The program is available through the National Safety Council at (312) 527-4800, extension 6900.

The **Emergency Information System/Chemical version (EIS/C)**, by Research Alternatives, Inc., provides information on chemicals, maps to plot spills, facility plans, and chemical inventories for businesses, as required by SARA Title III. Brochures, a demonstration disk, and additional information can be obtained by calling (800) 999-5009; in the Washington, DC area: (301) 424-2803.

Databases

Medline is an on-line program that consists of bibliographic citations from thousands of health-related journals. It is accessed through the National Library of Medicine (NLM). Call (800) 638-8480 or inside Maryland: (301) 496-6193 for more information. **Toxline** and **TOXLIT** are the NLM's on-line interactive collections of toxicological information, referencing materials in such areas as chemically-induced diseases, environmental pollution, occupational hazards, and pesticides. **Chemline** is an on-line chemical dictionary maintained by NLM.

Toxicology Data Network (Toxnet) is a computerized system of toxicologically-oriented data banks. Within this system, Hazard Substances Data Bank, Chemical Carcinogenesis Research Information Systems, and the Registry of Toxic Effects of Chemical Substances are available.

The **Hazardous Materials Incident Reporting System**, developed by the National Fire Information Council (NFIC) provides a collection of detailed information on reportable incidents.

The **TRANSCOM** system combines satellite communications, computerized database management, user networks, and ground communications to follow the progress of en-route shipments of some radioactive materials (usually fissile materials). The primary objective of TRANSCOM is to provide a central monitoring and communications center for DOE shipments of spent fuel, high-level waste, and other high visibility shipping campaigns. With this system, DOE can continuously monitor the location and status of these shipments within the continental United States.

TRANSCOM provides authorized users with TRANSCOM software to use with their personal computers, modems, and telephone lines. Authorized users can access the TRANSCOM system to obtain unclassified information concerning current and upcoming shipments.

In the event of an emergency, the vehicle operator can contact the TRANSCOM control center. If necessary, DOE is notified and decides on appropriate response measures. Information on key emergency response contacts for DOE-headquarters (HQ), the shipper, the state, and the appropriate DOE Operations Office is also available on-line in TRANSCOM.

